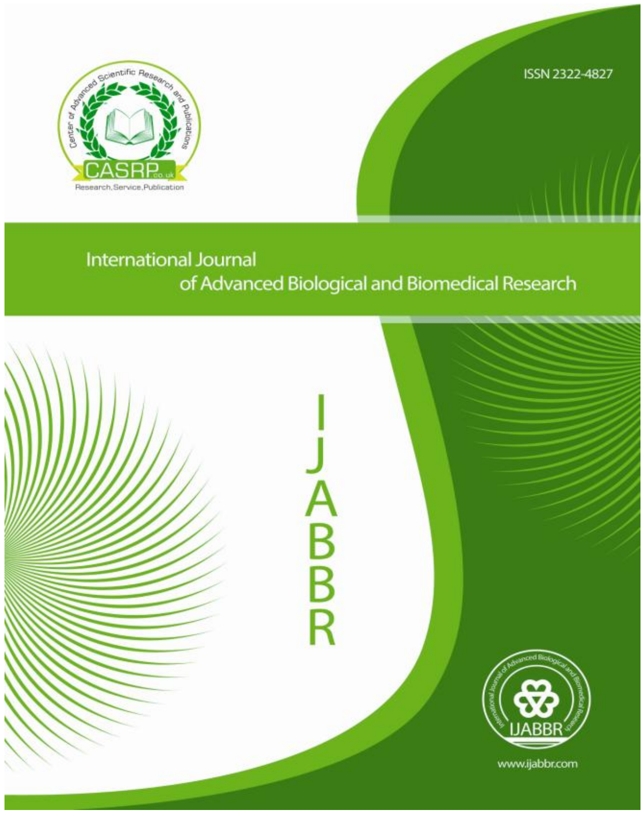
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Quantitative genetic analysis of Dromedary camel (Camelus dromedaris) under pastoral management in central desert of Iran

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Abstract

A Camel Research Station was established in 1990 at the central desert land of Iran named Kavir-e-loot, to evaluate productivity performance of one humped camel. The data consisted of birth weights (BW), three (W3), six (W6), nine (W9) months and yearling (W12) body weight of animals and the pedigree was registered during a period of 14 years since 1991 to 2004. The body weight traits of birth, three, six, nine months and yearling of camel calves were genetically analyzed using multiple trait animal models. The results showed low to moderate heritability for all of the studied traits. The lowest and highest value were for three 0.13 ±0.14 and six months 0.33±0.17, respectively. The genetic correlation between six months and yearling body weight was 0.47 ±0.38 which is lower than between six to nine months body weight, 0.79 ±0.37. The variances of common maternal effects for body weights were moderate For summer weights three, six, and nine months body weights, and high for winter, birth and yearling weight. The genetic parameter estimates indicated that the six months weight can be used as a selection tool for genetic improvement of growth traits considering its higher heritability and positive genetic correlations with succeeding growth traits.

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1. Introduction

The old world camels, Dromedary and Bactrian are essentially multi-purpose livestock (Safaa et al., 2013; Ayele et al., 2014). They produce milk and offspring and provide transport in pastoral husbandry systems in the Afro-Asian dry- land belt (Banerjee, 2006). They are used for milk, meat and fiber production, for riding, agricultural draught as well as for commercial transport and power source for small scale industries. Phenotypic characteristics such as color, size, and body proportions have been used to differentiate them. The quantitative performance parameters such as growth rate, milk yield, draught power, endurance, fiber yield, and fiber quality are rarely part of that description but often part of the reputation of an alleged breed (Banerjee, 2006; Brigitte, Kaufmann, 2005). In the references genetic parameters of these animals are very scarce (Al-Sobayil et al., 2006). The animal breeding methods were developed for condition of intensive commercial livestock production which in the industrialized the conditions is accepted as a basis for breeding high performance lines. These methods have been used only very sporadically in marginal tropical and sub tropical locations. In the last few decades, the condition for the rural population in these parts of the world which have became increasingly worse. This is in spite of all the efforts to introduce intensive farming. In the humid and arid zones of the developing countries, particularly at high tropical altitudes, most of the lands in the heavily populated regions have been developed and farming has spread to marginal areas. In these conditions most of the farm animals can not be kept and fed according to their requirements so as to exploit their full potential. This is because they are exposed to considerable seasonal food shortages and climate stress. The animal breeding methods require stability and continuity. Therefore the contribution of the science of animal breeding as far as developing countries are concerned is mainly in providing basic research information (Zarate, 1996). There are nearly 150,000 dromedary camels living in the desert areas (South and Central) of Iran; this is 0.56% of the world camel population and 3.8% of the Asian camel population (FAO, 2011). In one study the number of camels in each flock varied between 4 and 400. The make-up of the flock was 1 to 2% adult males, 7.5% male calves and 91% calves and adult female camels. On average the adult males were 10 (between 3 and 20) years old and the adult females were 16 (between 8 and 30) years old. The time of mating of camel began with the onset of the cold season (late autumn) and continued till early spring. One adult male camel was sufficient to impregnate 30 to 80 female camels (Salehi et al., 2009). A 2007 study flow sorted camel chromosomes, building on the fact that camels have 37 pairs of chromosomes (2n=74), and found that the karyotime consisted of one metacentric, three submetacentric, and 32 acrocentric autosomes. The Y is a small metacentric chromosome, while the X is a large metacentric chromosome (Balmus et al., 2007). In Iran researchers has studied Dromedary camel (Camelus dromedaris) seldom (Ghasemi Meymandi et al., 2015), hence the aim of the present study was to estimate the genetic parameters of body weight of camel calves in Yazd province located in central desert land of Iran.

2. Materials and methods

2.1. Animals and management

A Camel Research Station was established in 1990 at the central desert land of Iran named Kavir-e-loot, to evaluate productivity performance of one humped camel. The camel herd in the station was raised for meat (Emami Meybodi, 2006). The animals grazed on rangeland except at mating season and had been fed with supplement nutrient in the winter.

2.2. Data

The data consisted of birth weights (BW), three (W3), six (W6), nine (W9) months and yearling (W12) body weight of animals and the pedigree was registered during a period of 14 years since 1991 to 2004.

2.3. Statistical analysis

The fixed effects were estimated with GLM procedure of SAS (SAS Institute Inc, 1997). There were 1308 records of body weight of the calves from dams which assigned to 7 categories of (less than 5 years and 5 years interval to longer than 30 years), sex (male and female), 14 years and regression of calves age on days as covariate.

The DFREML software was used for genetic analyses of the data (Meyer, 2000). The Multiple-trait mode l (1) was used for all traits:

$$Y=Xb+ZaUa+ZcUc+\varepsilon$$

Where: Y is vector of live weight observation; X as incidence matrix of fixed effects; b vector of fixed effects; Za and Zc incidence matrices for random direct additive and common maternal environmental effects respectively; Ua and Uc vector of random animal and maternal common effects respectively and ε is vector of residuals.

$$E(Y) = X\beta \qquad E(\, Ua \,) = 0 \qquad var(\, Ua \,) = A\sigma^2 Ua$$

3. Results and discussion

3.1. Common maternal effects (C square)

The proportion of variance of common maternal effects (C^2) of seasonal body weights are moderate during hot seasons, (In summer W3, W6 and W9 which continually decreases) and high in suitable seasons (In winter BW and W12), which are in accordance with Saudi camels report (Al-Sobayil et al., 2006). The result was used as basic information of Dromedary Camels to introduce suitable male camels to herds under pastoral management. The least square mean and standard error of the traits are presented in table 1.

3.2. Body size

The yearling body weight is estimated as 163.9(±23.0) Kg.(Table 1) which is lower than the African (Al-Sobayil et al., 2006) and Indian breed (Hermas, 2006). The yearling body weight of Saudi, Libyan (Magrabi) and Indian camels are reported as 2.12(±15), 186.9(±3.8) and 213 Kg respectively.

3.3. Genetic parameters

3.3.1. Heritability

Direct heritability (h^2a) Genetic correlation, C-squared, common environmental maternal effect (c^2), Permanent environmental correlation and Residual correlation of the traits are presented in tables 2 and 3. It shows low to moderate Heritability, proportion of direct additive effects (h^2a) for all traits. These are as the same as Saudi camels (h^2a) of growth traits (Al-Sobayil et al., 2006). The lowest and highest rates of (h^2a) belong to (w3) and (W6) respectively. Body weight at 6 months with the highest (h^2a) is important for selection program to increase (w6) weight which is fitted to cull time 6-9 months age of progeny for more income. Genetic correlation between (W6) and (W12) is lower than its correlation between (W6) with (W9), so this selection criteria increase (W6) and (W9) but not affected so much (W12) which is closer to mature size than (W9 and W6).

Table 1
Least square mean and standard error of the weight traits.

Trait	No	Mean (Kg.)	Se (Kg)	C.V.
Birth weight (BW)	284	33.0	5.0	15.0
Three month (W3)	317	82.0	13.3	16.3
Six month (W6)	287	118.2	18.4	15.6
Nine month (W9)	264	142.8	20.0	14.0
Yearling (W12)	162	163.9	23.0	14.0

Table 2
Heritability (h2a) in diagonal, genetic correlations above diagonal.

Traits	BW	W3	W6	W9	W12
BW	0.28±0.19	0.53± 0.42	0.58± 0.28	0.37±0.35	0.22± 0.45
W3		0.13±0.14	0.89± 0.31	0.79±0.37	0.44±0.56
W6			0.33±0.17	0.80±0.17	0.47±0.38
W9				0.28±0.18	0.47±0.38
W12					0.18±0.19

Table 3
Common maternal effects (C2) for body weight for Dromedary camel in diagonal and their correlations below diagonal.

Traits	BW	W3	W6	W9	W12
BW	0.34±0.27				
W3	0.97±0.20	0.31±0.17			
W6	0.46±0.18	0.75±0.26	0.24±0.14		
W9	0.83±0.31	0.74±0.29	0.93±0.14	0.21±0.14	
W12	0.85±0.54	0.91±0.25	0.61±0.63	0.71±0.54	0.46±0.30

4. Conclusion

To estimate genetic parameters accurately and precisely relatively large data sets are required. However, given a very low reproductive efficiency in camel, the present work provides useful basic information concerning the genetic parameters for the future planning of breeding program for this species.

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